THAT WHICH IS CLAIMED IS:

1. A microstrip-to-waveguide power combiner comprising:

a dielectric substrate;

at least two microstrip transmission lines formed thereon in which amplified radio frequency signals are transmitted and terminating in microstrip launchers at a microstrip-to-waveguide transition;

a waveguide opening positioned at the transition;

a waveguide back-short positioned opposite the waveguide opening at the transition; and

isolation/ground vias formed within the dielectric substrate and around the transition that isolates the transition.

2. A microstrip-to-waveguide power combiner according to Claim 1, wherein the radio frequency signals comprise microwave or millimeter wavelength signals.

3. A microstrip-to-waveguide power combiner according to Claim 1, and further comprising a metallic plate on which said dielectric substrate is secured, and a back-short cavity formed within the metallic plate at the transition to form the waveguide back-short.

4. A microstrip-to-waveguide power combiner according to Claim 3, wherein the back-short cavity has a depth ranging from about 25 to about 60 mils.

5. A microstrip-to-waveguide power combiner according to Claim 3, wherein the waveguide back-short

is positioned for reflecting energy into the waveguide opening.

6. A microstrip-to-waveguide power combiner comprising:

a dielectric substrate;

at least two microstrip transmission lines formed thereon in which radio frequency signals are transmitted and terminating in microstrip launchers at a microstrip-to-waveguide transition, each microstrip transmission line having a power amplifier associated therewith and supported by said dielectric substrate;

a waveguide opening positioned at the transition;

a waveguide back-short positioned opposite the waveguide opening at the transition; and

isolation/ground vias formed within the dielectric substrate and around the transition that isolates the transition.

7. A microstrip-to-waveguide power combiner according to Claim 6, wherein the phase of power amplifiers is adjusted based on the location of microstrip launchers at the transition.

8. A microstrip-to-waveguide power combiner according to Claim 7, wherein the number of microstrip launchers is either two or four and the respective phase of said power amplifiers is 180 degrees or 90 degrees apart dependent on their location around the microstrip-to-waveguide transition.

9. A microstrip-to-waveguide power combiner according to Claim 6, wherein the power amplifiers

comprise microwave monolithic integrated circuits (MMIC).

10. A microstrip-to-waveguide power combiner according to Claim 6, and further comprising a metallic plate on which said dielectric substrate is secured, and a back-short cavity formed within the metallic plate at the transition to form the waveguide back-short.

11. A microstrip-to-waveguide power combiner according to Claim 10, wherein the back-short cavity has a depth ranging from about 25 to about 60 mils.

12. A microstrip-to-waveguide power combiner according to Claim 6, wherein the waveguide back-short is positioned for reflecting energy into the waveguide opening.

13. A coaxial-to-waveguide power combiner comprising a coaxial-to-waveguide transition having a waveguide opening;

at least two coaxial transmission lines in which radio frequency signals are transmitted and terminate in coaxial launchers inside the waveguide; and

a waveguide back-short positioned opposite to the waveguide opening.

14. A method of power combining radio frequency signals comprising the step of:

combining two or more amplified radio frequency signals at a microstrip-to-waveguide transition that is formed from a dielectric substrate and at least two microstrip transmission lines formed

thereon in which radio frequency signals are transmitted, wherein the transition includes a waveguide opening, a waveguide back-short positioned opposite the waveguide opening, each microstrip transmission line having a microstrip launcher extending into the transition, and isolation/ground vias formed within the dielectric substrate around the transition that isolate the transition.

15. A method according to Claim 14, wherein the radio frequency signals comprises millimeter wavelength signals.

16. A method according to Claim 14, and further comprising the step of forming the waveguide back-short in a plate on which the dielectric substrate is secured.

17. A method according to Claim 14, and further comprising the step of forming the waveguide back-short to a depth ranging from about 25 to about 60 mils.

18. A method according to Claim 14, and further comprising the step of amplifying each radio frequency signal at a power amplifier positioned on the dielectric substrate and associated with a respective microstrip transmission line.

19. A method according to Claim 18, and further comprising the step of adjusting the phase of power amplifiers based on the location of microstrip launchers at the transition.

20. A method according to Claim 14, wherein the power amplifiers are formed as microwave monolithic integrated circuits (MMIC).

21. A method according to Claim 14, and further comprising the step of positioning the waveguide back-short in a position for reflecting energy into the waveguide opening.

22. A method according to Claim 14, and further comprising the step of connecting a coaxial connector to the transition.